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**AN ATLAS OF SPECTRA
FROM 1.6 TO 5.4 MICRONS,
AIRCRAFT MEASUREMENTS OVER
NATURAL SURFACES AND ATMOSPHERES**

**W. A. HOVIS
M. TOBIN**

AUGUST 1967



GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

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INTRODUCTION

Between April 26 and June 17, 1966 a new type of spectrometer was flown in NASA's Convair 990 jet aircraft over a wide range of natural surface and atmospheric conditions. The spectrometer, described by Hovis, Kley and Strange (1), utilized a continuously variable interference filter wedge for wavelength discrimination from 1.6 to 5.4 microns. Spectral resolving power for the scans is nominally $\lambda/\Delta\lambda = 100$.

The spectrometer was mounted in the tail of the airplane and was unpressurized and unheated except during rapid descent when heat was applied to prevent condensation. Data was recorded, inside the pressurized cabin, on a strip chart recorder and later digitized utilizing a Concord X-Y digitizer.

The digitized data was reduced to corrected spectra with an IBM 360 computer with calibration curves obtained, in the laboratory, both before and after the flight.

The format chosen for presentation of the spectra is very similar to the manner in which it appears on the original recording. Energy is shown above and below a reference zero which corresponds to the reference black body in the instrument. Though the black body in the instrument was allowed to assume ambient temperature, all spectra have been reduced so that the zero line corresponds to 273°K. In the shorter wavelength section, 1.6 to 3 microns, the scale utilized for energy is compressed by a factor of ten from that used in the 3 to 5.4 micron interval. This allows the reflected solar energy to be shown on scale while showing some detail in the region where thermal emission predominates.

A short, descriptive, title is shown on each spectra as complete as available information allows. If a more complete position analysis is desired the reader may consult the publication "Support Data for Convair 990 Meteorological Flight I" (2).

A large number of spectra was taken, some of which were not considered of sufficient quality for publication. In almost all cases, inferior results were due to failure of the liquid nitrogen cooling system located in the tail of the aircraft. The spectra presented here have been partially interpreted and reported by Hovis and Tobin (3). But it is felt that rather than withhold all data for interpretation before publication it is desirable to release the data for use by any

interested persons at this time. A word of caution is in order concerning the data from 2.5 to 3 microns. Due to the water vapor bands in that spectral region little energy was seen and no useful information has been determined, to date, from that region. The 2.5 to 3 micron interval has been left in for continuity but should be used with caution. A second Convair 990 flight has already been completed eliminating that interval and scanning from 1.2 to 2.4 and 3.2 to 6.4 microns. These spectra are of higher quality and greater number than shown here and will be released as soon as reduced.

The spectra are presented in chronological order with the day and universal time noted on each. Both the raw data and the tapes of reduced spectra have been preserved and may, in a case of special need, be consulted by contacting the author.

REFERENCES

1. Hovis, W. A., Kley, W. A. and Strange, M. G., Applied Optics, Vol. 6, No. 6, 1057-1058 (1967).
2. Tobin, M. S., NASA-GSFC, X-622-67-32, (1967).
3. Hovis, W. A., and Tobin, M., NASA-GSFC, X-622-67-18 and Applied Optics, in Press.



























































































































































































































































































































































































































































































































































































































































































